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(54) **An auxiliary fuel supply device for internal combustion engines.**

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An auxiliary fuel supply device for internal combustion engines

This invention refers to a carburetor for furnishing air and fuel to an internal combustion engine, the carburetor having a main fuel and air mixing passage controlled by a throttle with an air inlet end and a fuel and air outlet end with the throttle between the two ends, a body of fuel absorbing, porous material lying adjacent a wall of the carburetor mixing passage between the air inlet and the throttle, having a dimension to allow free flow of air through said main passage and past one surface of said body of porous material, a fuel chamber in the carburetor, and a fuel passage in the carburetor leading to said body of porous material to deliver fuel from said fuel chamber to said body of porous material to provide a source of fuel to aid in starting the internal combustion engine.

A carburetor of this type is disclosed in GB—A—167 946. In such carburetor, the body of porous material is comprised of an annular ring surrounding an annular channel formed in the wall of the fuel and air mixing passage. The fuel passage opening into said annular channel is connected at its upstream end to the fuel chamber which, in this case, is a float chamber. With this structure, it is only the level in the float chamber that governs the availability of the starting charge. A long period of non-use would reduce this level and provide no starting charge. Furthermore, due to the annular form of the porous material there is a risk of drawing the starting charge from the porous material at an increased rate resulting in choking of the engine by an overrich charge.

It is an object of the present invention to provide a simply auxiliary fuel supply device to supply auxiliary fuel to an engine for easy starting in a controlled and safe manner.

According to the present invention, a carburetor as defined above is characterized in that said body of porous material lies against a wall on only one side of said main passage, said fuel passage opening directly into said body of porous material, and in that a manually operable pump on the carburetor is connected to said fuel chamber and said fuel passage, whereby actuation of said pump will move fuel from said fuel chamber to said body of porous material.

The use of priming pumps has become known from e.g. US—A—3 275 305. US—A—3 272 485 discloses a carburetor having a porous material in both the main jet and the idle jet, and the idle jet.

The structure according to the present invention and as defined above allows for fuel to be pumped into the porous material regardless of the position of the carburetor body and ensures that it will not be simply dumped into the air passage. The system of the present invention allows the starting charge to be drawn from the porous material at a suitable rate to prevent choking of the engine by an overrich charge.

Furthermore, the porous material will collect any fuel that spills back towards the air inlet due to tipping of the carburetor or due to what is called "spit-back" from the engine.

The invention will now be explained in more detail with reference to the accompanying drawings in which:

FIGURE 1, a vertical section through a carburetor showing the functional parts.

FIGURE 2, a section on line II—II of FIGURE 1.

With reference to the drawings, a carburetor 10 is shown embodying the invention. The carburetor 10 is provided with a carburetor body 14 with an orifice 12 formed therein, and a rotary throttle valve 16 is mounted in the body having an opening equal to the effective diameter of said air orifice 12. One end 18 of said air orifice 12 opens to one side of the carburetor body 14 as readily can be seen in FIGURE 2 which shows a sectional part of the carburetor 10.

Although not illustrated, the end of said opening is connected with an internal combustion engine, for example, a two-cycle engine air inlet. The other end 20 of the air orifice 12 opens to upward of the carburetor body 14 as shown in FIGURE 2, and said end opening 20 is connected with an air cleaner through an air pipe not illustrated. The air pipe, air orifice 12, and air intake provide an air intake passage for said engine.

As shown in FIGURE 1, the carburetor 10 is provided with a fuel supply device 28 as has well been known, which includes a fuel pump 22, and a diaphragm chamber 26, part of which is formed by a recess in the body and defined by diaphragm 24.

The fuel pump 22 is a diaphragm pump that is known. The pump consists of a diaphragm 34, together with seal material 32, which is held between the carburetor body 14 and a cover 30, along with a pair of check valves 36 and 38. The pulsing crankcase pressure of the engine, e.g., the crank chamber pressure of the two-cycle engine, will be introduced into the diaphragm chamber 40, formed on the outside of the diaphragm 34 through the opening 41.

Consequently, when the engine is operating, as has well been known, the pump 22 sucks in fuel from the fuel tank 42 into the pump chamber 44, formed on the other side of the diaphragm 34, through the opening 43 and one of the check valves 36. This fuel will be transferred under pressure into diaphragm chamber 26 through the passage 46 from the other check valve 38.

In the diaphragm chamber 26, an inlet needle valve 48 is provided for intermittently opening and closing passage 46. The inlet needle valve 48 is connected with the diaphragm 24 and through a swing lever 52 that is biased by the

spring 50. As has been well known, because of the intermittent functioning of said inlet needle valve 48, fuel will intermittently be taken via the passage 46 into the diaphragm chamber 26 and thence to the engine. With this function, a proper amount of fuel is normally reserved in the diaphragm chamber 26.

Fuel in this diaphragm chamber 26 will be guided to the fuel nozzle 56 (FIGURE 2) of the rotary throttle valve 16 via the fuel supply passage 54. By the suction of the engine, the guided fuel will be sucked into the air orifice of the carburetor 10, an integral part of the air passage, and then will be mixed with air taken into the air cleaner. This mixture will be supplied to the engine through the air supply passage 12. According to the example on the drawings, there is a fuel guide groove 60 that leads the fuel from the concavity 58 into the engine. The groove is provided in the exterior circumference of the throttle valve 16 for the purpose of preventing fuel from collecting in the concavity 58. The concavity is formed with the throttle valve 16 and the carburetor body 14. In fuel supply passage 54, a check valve 62 is fixed to prevent air counterflow into the diaphragm chamber 26 from said supply passage 54 when operating the primer as explained later. There is also an adjustable needle 64 to adjust fuel provided.

Normal operation of the engine following its starting can be ideally maintained with the fuel supply from the fuel supply device 28 and in response to the throttle valve 16 functioning. However, at the engine starting, sufficient mixture of fuel to raise its starting capability cannot be supplied to the engine with only fuel from said nozzle 56 of the fuel supply device.

For the purpose of raising the starting capability of the engine, the auxiliary fuel supply device, in accordance with this invention, is provided with the carburetor 10. This auxiliary fuel supply device comprises the following: the fuel retainer means 68 of absorbent material, installed in the concavity 66 locating at the air cleaner side, i.e., upstream side from the throttle valve 16 to said air orifice 12. A fuel passage 70 is provided to guide auxiliary fuel to the retainer means 68 at the starting from the auxiliary fuel supply device 72 (FIGURE 1).

The fuel retainer means 68 is made of a sponge material in a block style as shown on the illustrated example. This sponge material is housed in the concavity 66 and with its bottom bonded onto the wall of the concavity. The fuel retainer means can be made of water absorbent material, various oil resistant materials, and of porous material, oil resistant, such as cast metallic material in lieu of said sponge material.

As indicated in FIGURE 2, the illustration shows an aperture 82 forming an opening 78 and closed by a light transparent disc material 80. This aperture is provided on the side wall 76 opposite to the other side wall of the carburetor body 14, a part of the aperture including

the concavity 66, and on the portion of the carburetor where the air orifice 12 opens. This aperture is not necessary, but in supplying auxiliary fuel to the retainer means, and for preventing fuel overflow from said retainer means, the aperture 82 is desirable for observation purposes. A clear synthetic resin is preferred to be used to close the aperture at 80. The aperture 82 need not necessarily be located at the side wall 76, but should be in a location from where said retainer means 68 can be watched from outside of said carburetor 10.

The auxiliary fuel guiding passage 70 leading to the retainer means is formed in the carburetor body 14, and one end of said guiding passage 70 is connected with a supply device 72. The other end of said guiding passage 70 opens at the concavity wall 74 where the retainer means 68 is bonded, i.e. it opens directly into the body of the retainer means 68.

The guiding passage 70 is open to the wall 74, as mentioned above, to make the fuel flow from said guiding passage 70 to said retainer means 68 without fail and regardless of the position of the carburetor.

According to the example shown in FIGURE 1, the supply device 72 is a pump consisting of a resilient cap 86, which is fixed on the cover 30 to provide a pump chamber 84, with a pair of check valves 88 and 90. With respect to the structure and a simplification in assembly, it is advantageous to locate the check valves 88 and 90, the diaphragm 34 of the fuel pump 22 and the check valves 36 and 38 in a single resilient sheet. The suction port 92 of the pump 72, with which the check valve 88 of one end is associated, opens to the fuel supply passage 54 through the passage 94, built in the carburetor body 14. The exhaust opening 96 of the pump 72, with which the other check valve 90 is associated, opens to the guiding passage 70.

According to the example shown in FIGURE 1, the passage 94 opens to the fuel supply passage 54 in between said check valve 62 and needle 64, and said passage 94 is connected to the diaphragm chamber 26 via the fuel supply passage 54. In lieu of this, said passage can be directly made open to the diaphragm chamber 26. But, for the sake of preventing an excessive fuel supply in high speed operation of the engine after it is started, as illustrated, it is desirable to make the passage 94 open to the fuel supply passage 54 at the fuel nozzle 56 side rather than the needle 64 side.

Prior to starting of the engine, the auxiliary fuel supply device, pump 72 is manually operated. As the resilient cap 86 is repeatedly pressed from the manual operation, a suction pressure functions in the diaphragm chamber 26 by suction of the pump 72. By the suction, the fuel of the fuel tank 42 will be guided to the diaphragm chamber 26 through the fuel pump 22 regardless of non-operation of the engine, i.e., non-working of the fuel pump 22. So the pump 72 functions as a suction primer pump.

When fuel is filled in said diaphragm chamber 26 by pump 72, and with the subsequent manual operation of pump 72, excess fuel will be transfused to said retainer means 68 via said passage 94, the pump chamber 84 and the guiding passage 70. This retainer means 68, from its absorbent capability, does positively absorb and retain the fuel supplied through the retainer means, and the retainer fuel can serve as auxiliary fuel.

The auxiliary fuel, absorbed and retained by the retainer means 68, can positively be retained in the retainer means 68 as long as no suction pressure functions on the suction passage 12 and regardless of the carburetor 10 position. So no retaining fuel will directly run into the air inlet of the engine when it is not in operation. When suction pressure is produced by the starting of the engine, the retaining fuel will be mixed with fuel from the fuel nozzle 56 together with air taken from the air cleaner entering through end 20. Then the mixture of fuel and air through the above process will in sequence be supplied to said engine. Thus, the starting of the engine will be facilitated.

For the sake of preventing the fuel retainer means from trapping of the fuel from fuel nozzle 56, the retainer means is installed on the upstream side as illustrated. Without providing said concavity 66, the retainer means can be directly bonded on the wall of air passage 12 which includes the air orifice 12. In order to avoid increasing the resistance against the air current in the air supply passage 12, it is desired to provide the concavity 66 as aforementioned, in which concavity said retainer means is to be housed.

The auxiliary fuel supply device, developed from this design, can be built in with a diaphragm carburetor provided with a butterfly throttle valve as well as a float system carburetor with a float that has well been known. Further the auxiliary fuel supply device may be provided with some other part; for instance, said air pipe or suction air passage, other than the carburetor, that is an integral part of an air supply passage of an internal combustion engine.

According to the auxiliary fuel supply device developed from this design, the fuel supplied to the retainer means will positively be absorbed and maintained by said retainer means as the auxiliary fuel regardless of the engine position. Since the auxiliary fuel will be sucked into said engine by negative suction pressure in sequence following starting of internal combustion engine, it makes it possible to raise the mixture strength at the starting of said internal combustion engine. From this effect and with this simple structure, the starting characteristics of the internal combustion engine are greatly improved without making use of a choke device which controls the amount of air intake.

Claims

1. A carburetor for furnishing air and fuel to an internal combustion engine, the carburetor having a main fuel and air mixing passage (12) controlled by a throttle (16) and with an air inlet end and a fuel and air outlet end with the throttle (16) between the two ends, a body of fuel absorbing, porous material (68) lying adjacent a wall (74) of the carburetor mixing passage (12) between the air inlet and the throttle (16), having a dimension to allow free flow of air through said main passage and past one surface of said body of porous material (68), a fuel chamber (26) in the carburetor, and a fuel passage (70) in the carburetor leading to said body of porous material (68) to deliver fuel from said fuel chamber (26) to said body of porous material (68) to provide a source of fuel to aid in starting the internal combustion engine, characterized in that said body of porous material (68) lies against a wall (74) on only one side of said main passage (12), said fuel passage (70) opening directly into said body of porous material (68), and in that a manually operable pump (72) on the carburetor is connected to said fuel chamber and said fuel passage (70), whereby actuation of said pump (72) will move fuel from said fuel chamber (26) to said body of porous material (68).

2. A carburetor as defined in claim 1, characterized in that said body of porous material (68) is bonded to a wall (74) of a concavity (66) on said main passage (12).

Revendications

1. Carburateur destiné à alimenter en air et carburant un moteur à combustion interne, ce carburateur comportant un conduit (12) principal de mélangeage de carburant et d'air commandé par un papillon (16) et présentant une extrémité d'admission d'air et une extrémité de sortie de carburant et d'air, le papillon (16) étant disposé entre les deux extrémités, une masse de matière poreuse (68) qui absorbe le carburant et se situe près d'une paroi (74) du conduit (12) de mélangeage entre l'admission d'air et le papillon (16), le carburateur ayant une taille permettant le libre écoulement de l'air à travers ce conduit principal et en regard d'une surface de ladite masse de matière poreuse (68), ce carburateur comportant une chambre (26) de carburant ainsi qu'un conduit (70) de carburant conduisant à ladite masse de matière poreuse (68) pour délivrer de carburant de la chambre (26) à ladite masse de matière poreuse (68) pour qu'elle constitue une source de carburant destinée à faciliter le démarrage du moteur à combustion interne, carburateur caractérisé en ce que ladite masse de matière poreuse (68) se situe contre une paroi (74) d'un côté seulement dudit conduit (12) principal, ledit conduit (70)

de carburant débouchant directement dans ledit corps de matière poreuse (68), et en ce qu'une pompe (72), actionnable à la main, du carburateur est reliée à la chambre de carburant et au conduit (70) de carburant, de sorte que la manoeuvre de cette pompe (72) va déplacer du carburant de la chambre (26) vers la masse de matière poreuse (68).

2. Carburateur selon la revendication 1, caractérisé en ce que la masse de matière poreuse (68) est collée à une paroi (74) d'une concavité (66) dudit conduit principal (12).

Patentansprüche

1. Vergaser zum Zuführen von Luft und Kraftstoff zu einer Brennkraftmaschine, mit einer Hauptmischkammer (12), die von einer Drossel (16) gesteuert wird und ein Lufteinlaßende und ein Kraftstoff/Luft-Auslaßende aufweist, wobei die Drossel (16) zwischen den beiden Enden angeordnet ist, einem kraftstoffabsorbierenden, aus porösem Material bestehenden Körper (68), der neben einer Wand (74) des Mischkanals (12) des Vergasers zwischen dem Lufteinlaß

und der Drossel (16) liegt und so dimensioniert ist, daß Luft frei durch den Hauptkanal und vorbei an einer Fläche des Körpers (68) strömen kann, einer Kraftstoffkammer (26) im Vergaser und einem zum Körper (68) verlaufenden Kraftstoffkanal (70) im Vergaser zur Abgabe von Kraftstoff aus der Kraftstoffkammer (26) an den Körper (68), um einen das Anlassen der Brennkraftmaschine unterstützenden Kraftstoffvorrat bereitzustellen, dadurch gekennzeichnet, daß der aus porösem Material bestehende Körper (68) nur an einer Seite des Hauptkanals (12) gegen eine Wand (74) anliegt, wobei sich der Kraftstoffkanal (70) direkt in den Körper (68) öffnet, und daß eine manuell betätigbare Pumpe (72) am Vergaser mit der Kraftstoffkammer und dem Kraftstoffkanal (70) verbunden ist, wodurch bei Betätigung der Pumpe (72) Kraftstoff aus der Kraftstoffkammer (26) zum Körper (68) fließt.

2. Vergaser nach Anspruch 1, dadurch gekennzeichnet, daß der aus porösem Material bestehende Körper (68) an einer Wand (74) einer konkaven Vertiefung (66) an dem Hauptkanal (72) befestigt ist.

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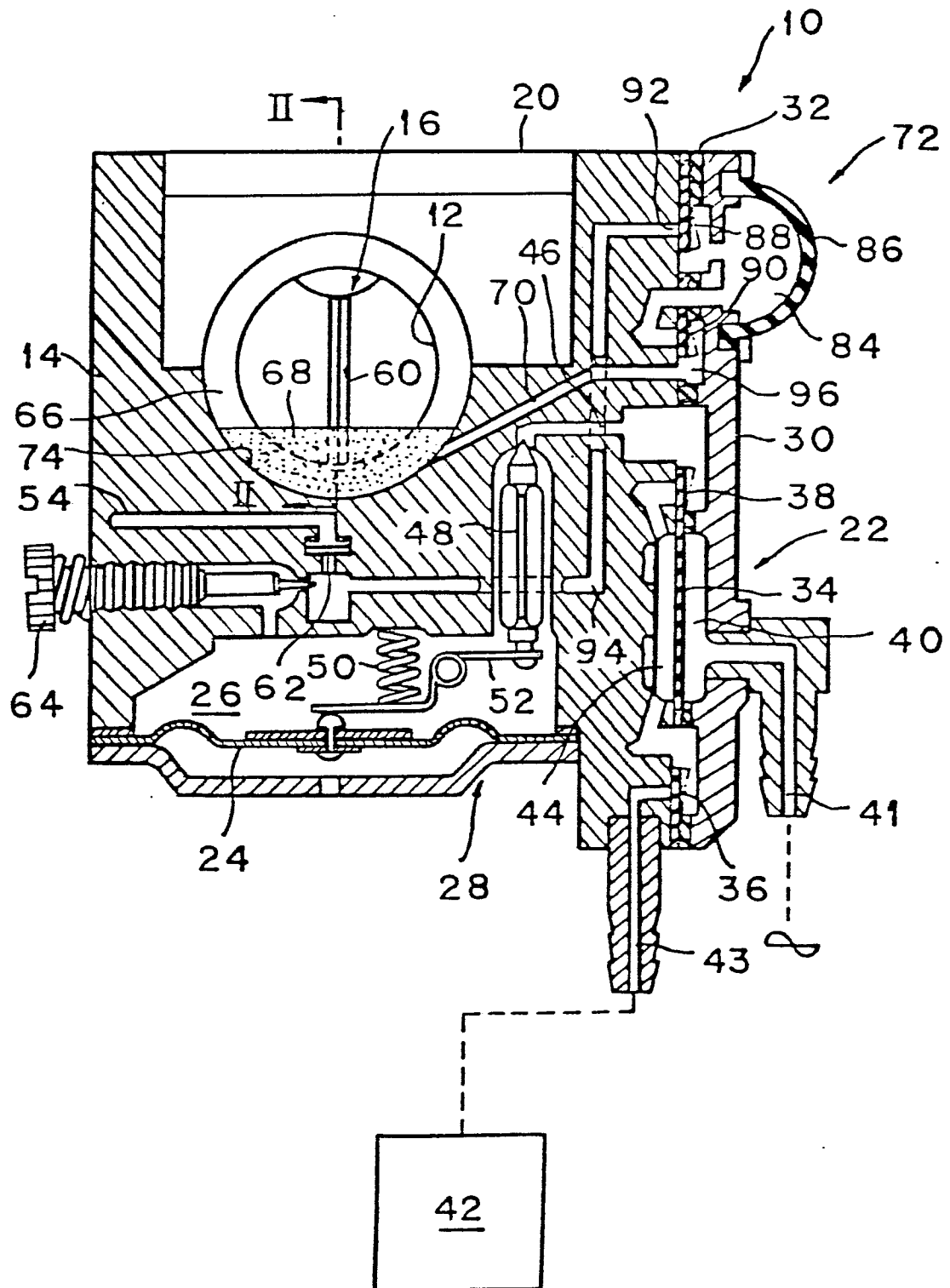
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FIG. 1



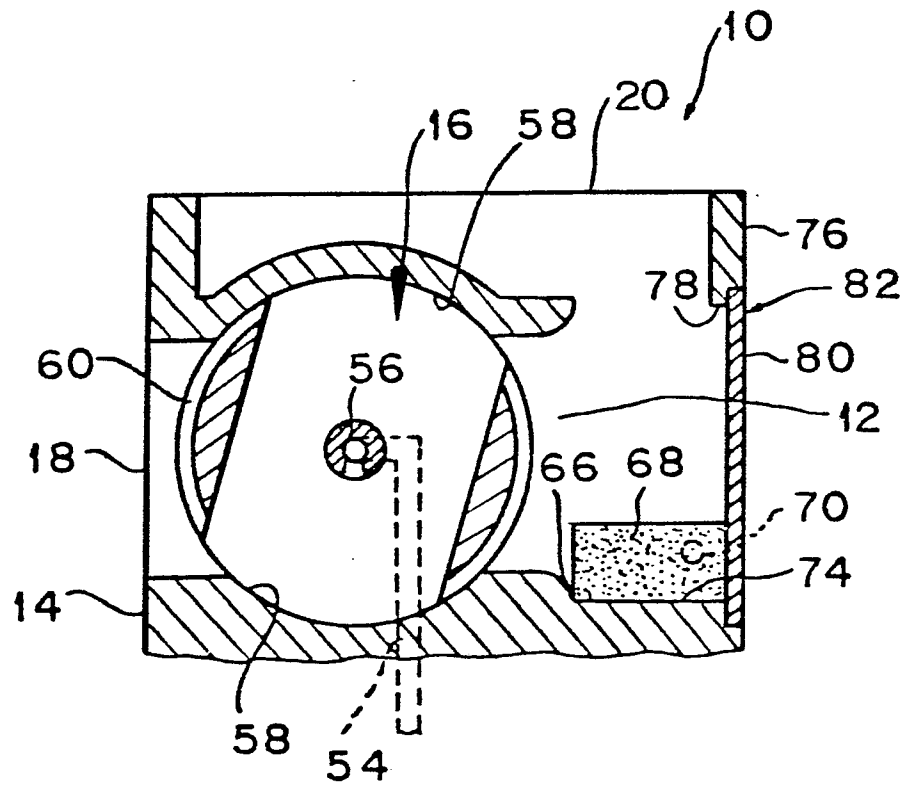


FIG. 2